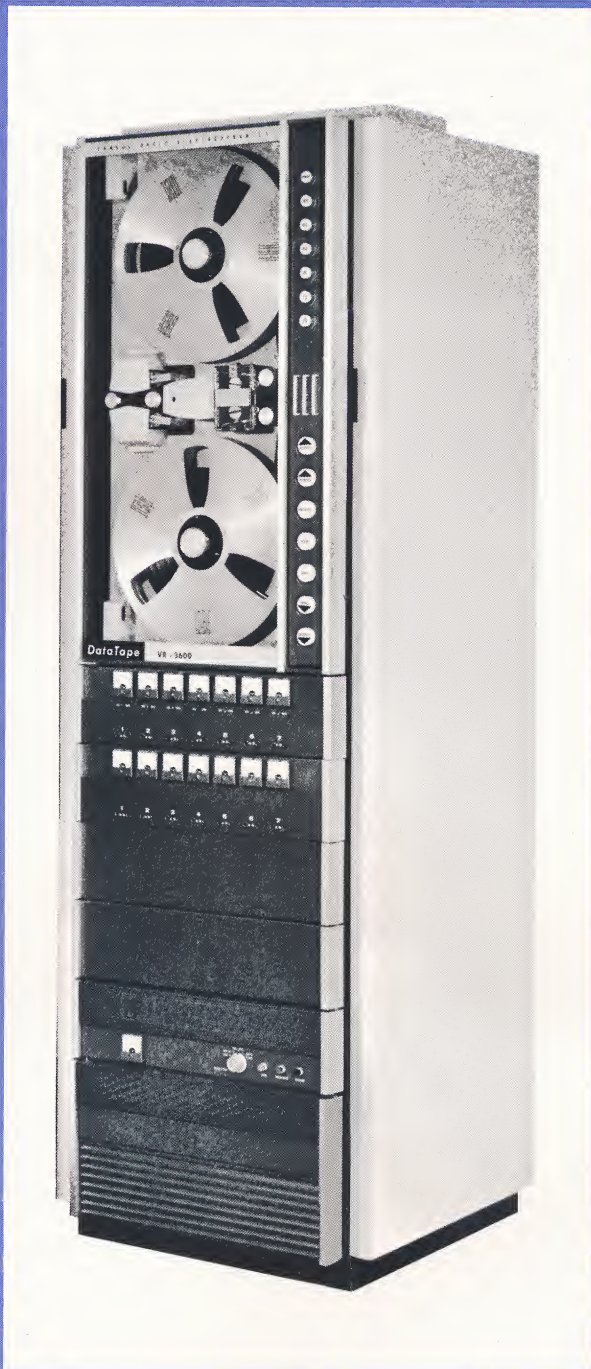


VR-3600 MAGNETIC TAPE RECORDER/REPRODUCER



CEC

DATA RECORDERS DIVISION

CONSOLIDATED ELECTRODYNAMICS

A SUBSIDIARY OF
BELL & HOWELL

VR-3600 MAGNETIC TAPE RECORDER/REPRODUCER

FEATURES

1.5 MC Direct Frequency Response

Switch Selectable 250 KC Compatibility Available

Complete Selection of FM Electronics for Compatibility and Versatility

Linear Phase Vs Frequency Characteristics

7 or 14 Channel Record/Reproduce

Solid-State Modular Electronics

Local/Remote Control of all Modes Including Speeds

Complete Six-Speed Automatic Equalization of Electronics

Vacuum/Ionization Tape Cleaner Available

Unique All-Metal Front Surface Magnetic Heads

Shuttle Control Capable of Remote Operation

Closed Loop Capstan Drive and High Accuracy Tape Guidance System

Individually Adjustable Forward and Reverse Search Modes

End-of-Reel Sensing with Fail-Safe Mechanical Brakes

Automatic Transfer at End-of-Reel with Overlap

Designed to Meet MIL-I-26600 RFI Requirements

Special PCM Requirements Fulfilled in Both Direct and FM Electronics

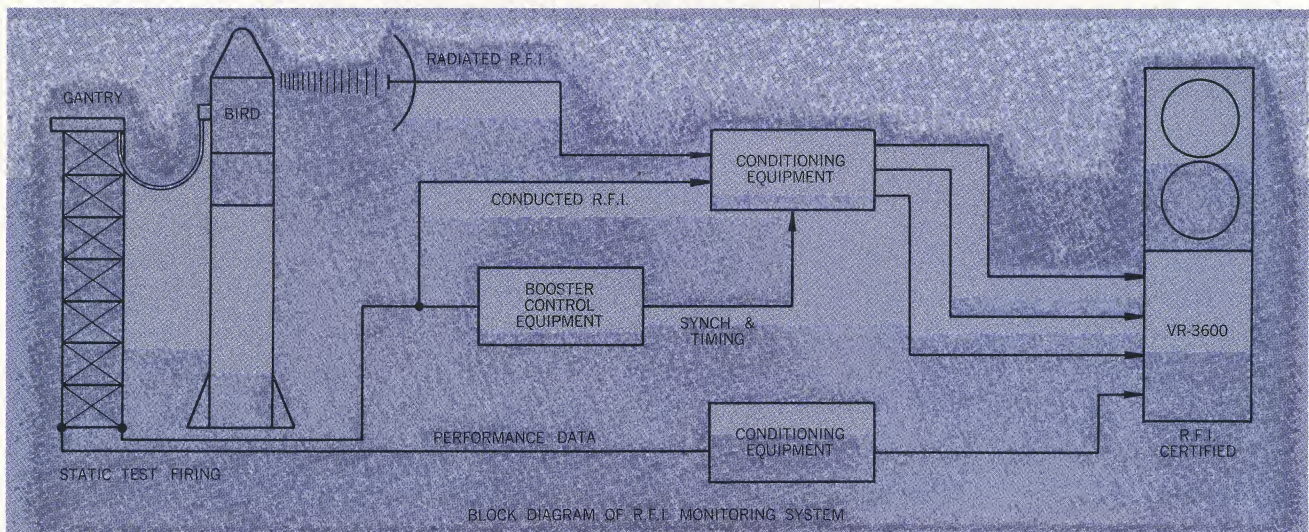
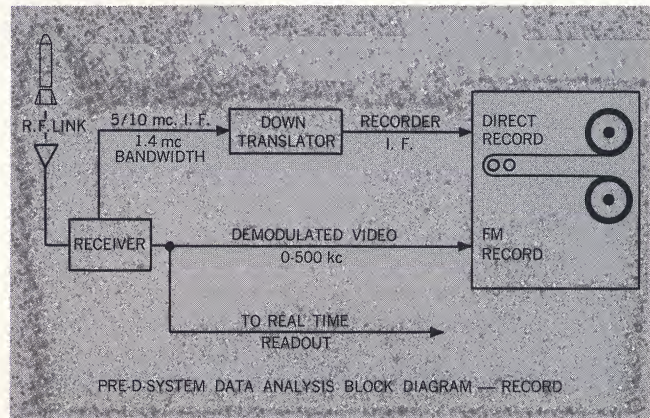
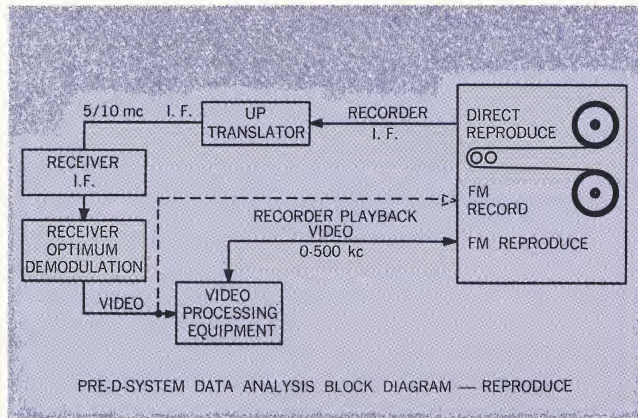
D-C - 1.5 MC Monitor Scopes and Many Other Accessories

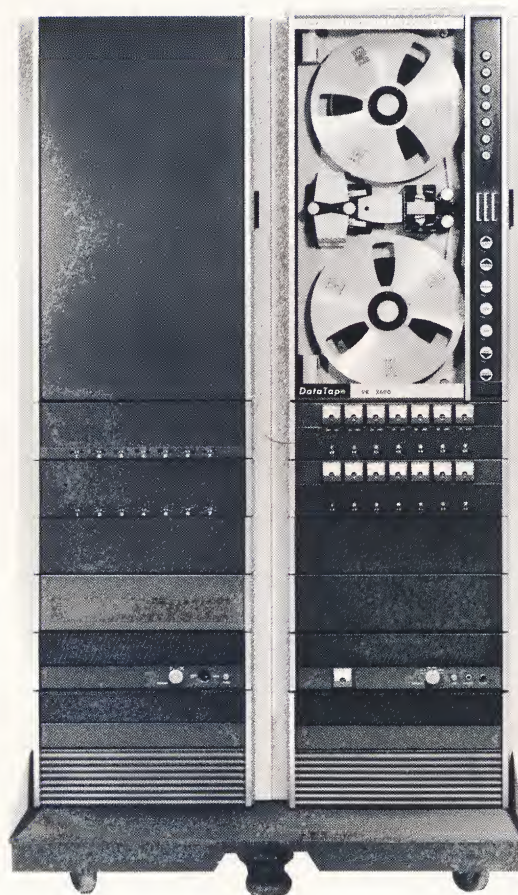
APPLICATION

Consolidated's VR-3600 Magnetic Tape Recorder/Reproducer was designed to fulfill the need for an extremely wide bandwidth, multichannel system with performance superior to any comparable instrumentation recorder. The design imposed little restriction on the recorder compatibility with lower class instrumentation recorders; for instance, many of the VR-3600's electronics are directly interchangeable with those of Consolidated's Type VR-2600 Recorder/Reproducer. This design foresight makes the VR-3600 the most versatile, general purpose 1.5 mc system on the market.

Each of the VR-3600's channels can be used for data storage in the 400 cps to 1.5 mc or the d-c to 500 kc

frequency range with high signal-to-noise and low distortion characteristics. In telemetry system applications, the unit's linear phase, SNR, and low distortion direct system provide the qualities necessary to handle pre-detection recording/reproducing. The Video (dc-500 kc) FM system of the VR-3600 permits post-detection recording/reproducing of PCM, PPM, PAM, FM multiplex, time code, communications, and other video signals. Conventional IRIG or Wideband (dc-40 kc) FM electronics are available for interchange with the direct electronics to provide proper compatibility with recorders presently utilized on ranges and in laboratories throughout the world.





SYSTEM CONCEPT

The wideband system concept of the VR-3600 is based upon utilization of new techniques for wideband magnetic tape recording/reproducing head design and construction. These highly efficient magnetic heads require no "head drivers" or other special power devices to obtain a constant flux recording on magnetic tape. The system incorporates capabilities or provisions for performing the tasks of earlier, lower bandwidth recorders as well as those for wideband applications.

Most data generated within instrumentation systems now in use (or planned for future use) can be recorded by a wide bandwidth recorder and/or a d-c coupled, relatively wide bandwidth instrument. The VR-3600 is capable of recording/reproducing this information via direct and/or FM techniques. Its modular record and reproduce electronics, plug-in operating speed components, accessory complement and form factor variations available as stand-

ard provide greatest flexibility in both new equipment selection and future system expansion.

HUMAN ENGINEERING

The VR-3600 Magnetic Tape Recorder/Reproducer was designed and built with special consideration for customer operational requirements. To enhance ease of operation and maintenance, complete front accessibility is provided. Controls for system power, speed, and mode are centrally located on the tape transport, front-panel-mounted and back-lighted. Control identification appears on the control pushbutton; mode controls are color coded to provide identification from a distance.

Transport and electronics are located in such a manner that tape loading, set-up, and maintenance can be accomplished with ease. Plug-in amplifier installation from the top of the amplifier mounting assemblies permits easy access to all controls, adjustments, and test points.

TAPE TRANSPORT

The VR-3600 Tape Transport was designed and constructed to provide top performance under constant use. Six tape speeds, selectable by push-buttons on the transport or via an accessory remote control unit, permit change of operating data storage capacity while the system is in operation. All speed sensitive elements of the electronics are automatically selected for the appropriate tape speed whenever it is changed. Significant manhour savings and machine data handling time is thereby made available since resetting of the system after speed change is unnecessary.

Tape guidance is controlled by a tape "chute" designed to locate the tape edges on the chute edges. The tape itself is utilized as a structural member for extremely accurate tracking and alignment as it passes into and out of the head/capstan area. Improved track-to-track time correlation over other conventional analog recorders is provided by the VR-3600.

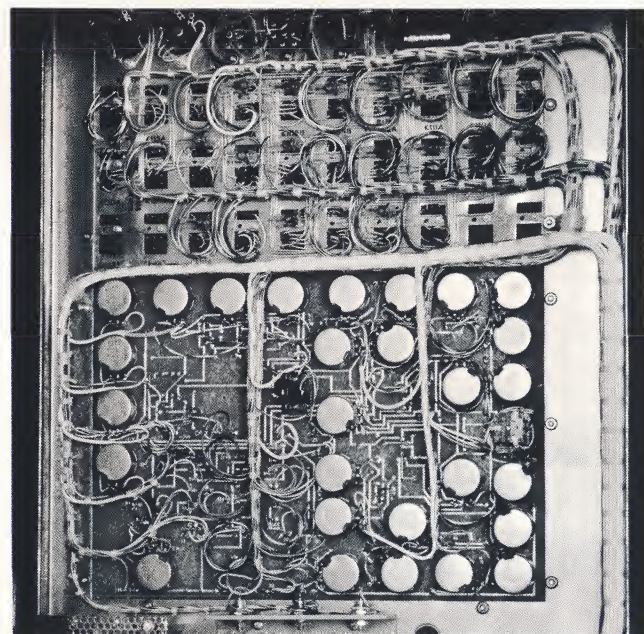
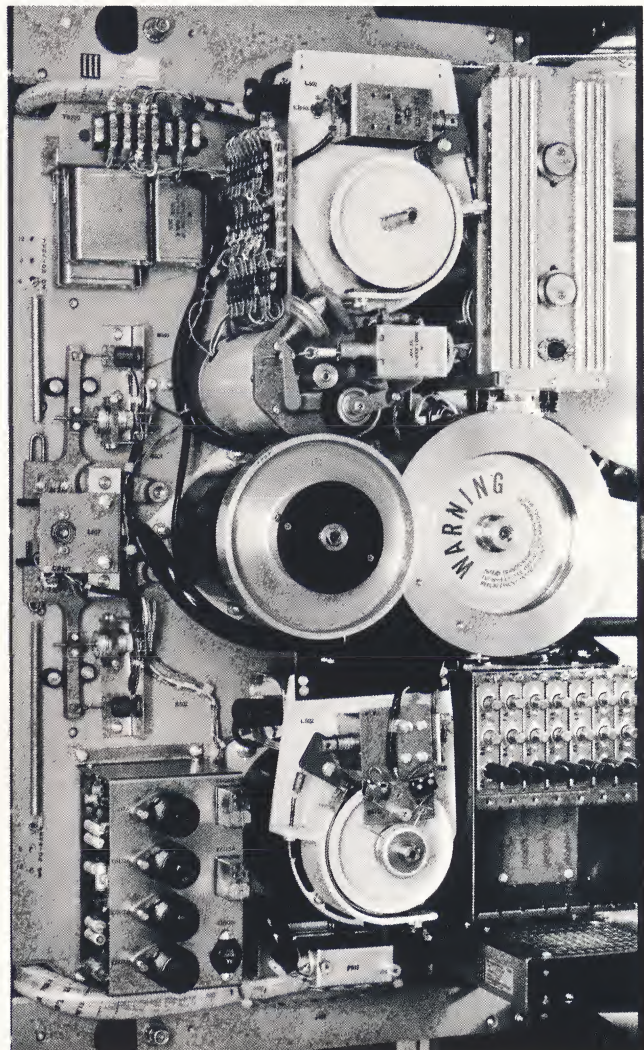
Tape tension sensing on the VR-3600 is accomplished by a low-displacement tension sensing/guide roller. Position equilibrium of the roller is determined by tape tension opposing a spring-damped preset force.

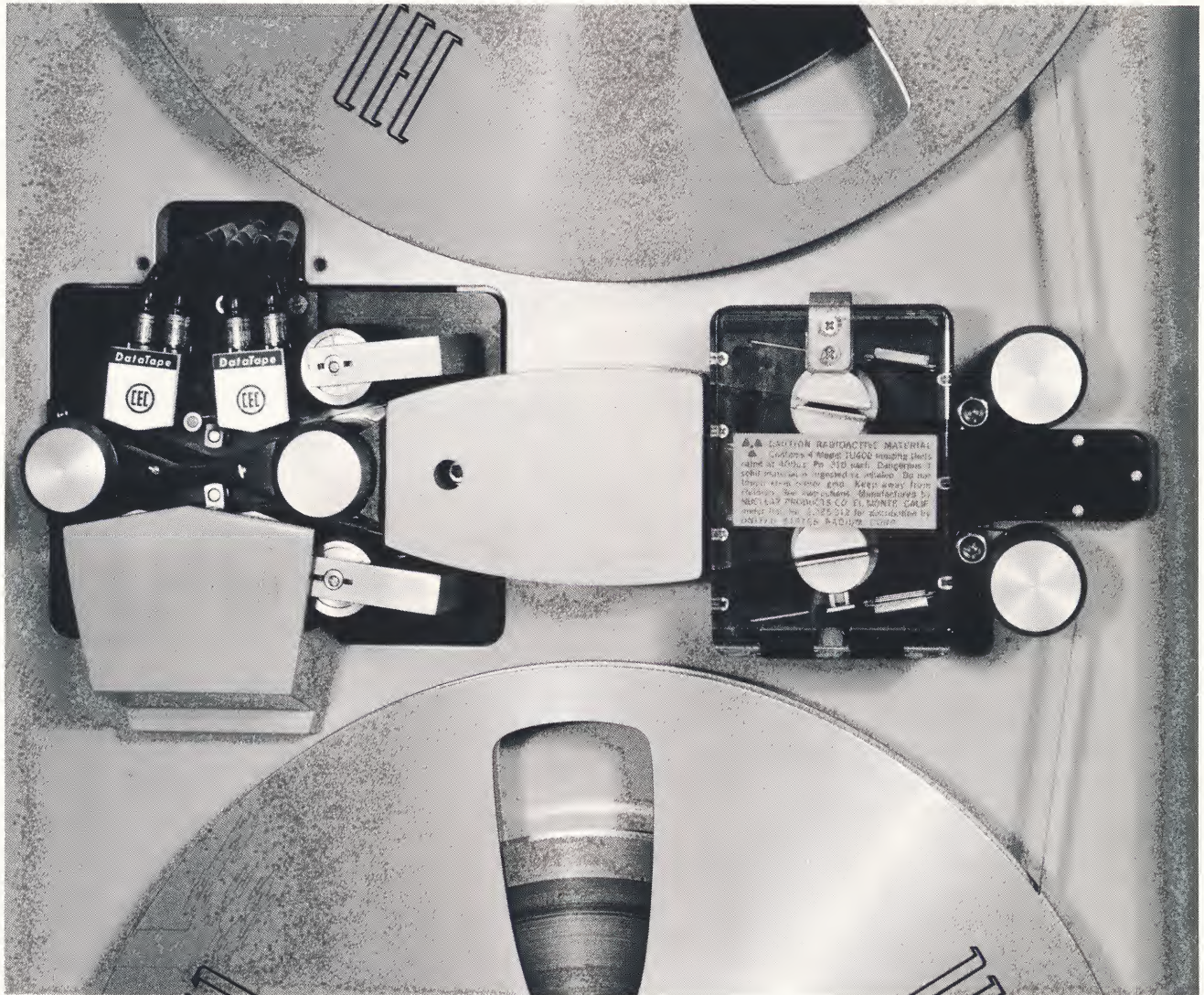
A differential transformer, with an output proportional to the position of the tension sensing/guide roller, controls the output of a magnetic amplifier driving the reel motor. An identical system is used on both supply and takeup reels. Thus, closed loop servo control of tape tension is accomplished from supply reel to takeup reel. System performance in the areas of signal stability, tape handling and component life are enhanced by this tensioning system.

Tension control is used in all operating modes to preclude damage to the tape and to provide controlled "stacking" tension on the reels. Photo-electric end-of-reel sensing provides automatic stop of the transport and transfer recording (start signal) to a standby recorder without any special preparation of the tape. A 30-second overlap of data recording precludes data loss during transfer. Automatic stop (and transfer) via fail-safe mechanical brakes occurs if the tape breaks or runs off the reel—or if power fails. Dynamic braking is in effect during all tape motion modes.

Hinge mounted transport provides complete front accessibility. Modular mounting of assemblies to transport plate permits easy maintenance. (Top right)

Back side of pivoted transport electronics panel shows full accessibility of all circuit points. (Lower right)





Heart of tape transport is its magnetic heads, capstan drive, chute guidance, tape cleaner, and tension control servo guides.

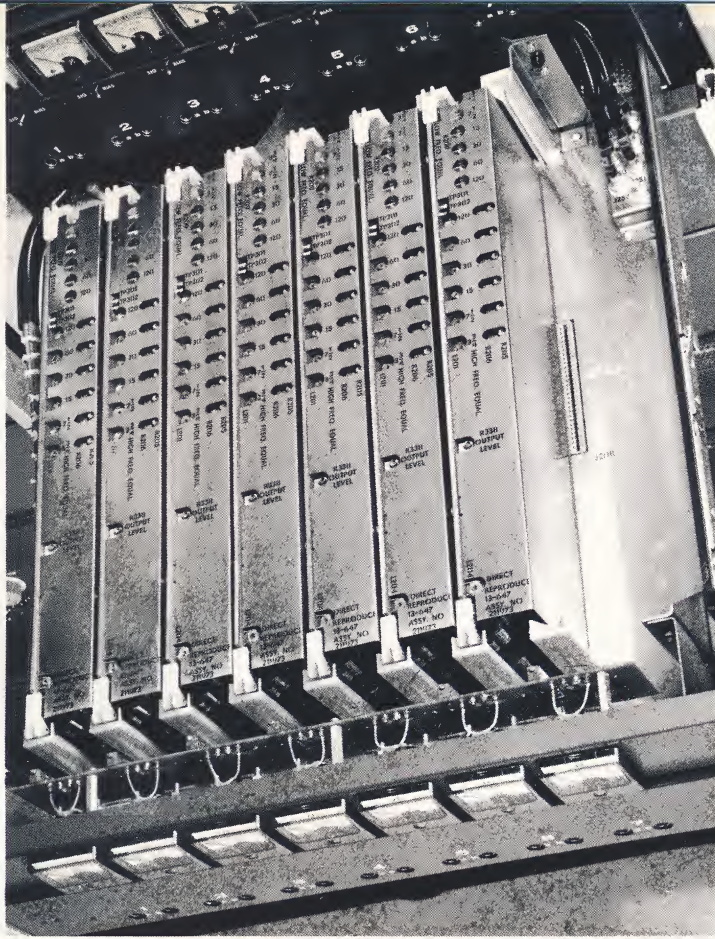
MAGNETIC HEADS & TAPE CLEANER

The highly-efficient magnetic heads for the VR-3600 employ all-metal front surface construction of each headstack to provide a self-cleaning action and a long life.

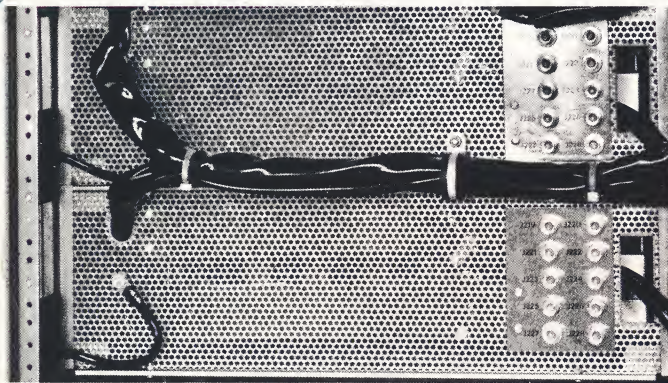
An all metal pole tip magnetic head design and construction as employed in the VR-3600 design provides close magnetic coupling between tape and heads as well as accurate gap azimuth alignment of all heads in a headstack. As a result, multichannel simultaneous operation to 1.5 mc frequency response with high signal-to-noise ratio, low crosstalk, and distortion is provided. These highly efficient magnetic heads allow the VR-3600 to be

the standard of the industry by its unique capability of maintaining consistent flux recording to 1.5 mc, without the necessity of high power head drivers and their ensuing head and tape heating and limitations invoked on head and tape life.

An accessory ion bombardment and a vacuum scavenged tape cleaner located at the entrance/exit of the magnetic head area assures exact head-to-tape contact requirements and signal output uniformity. Dust and oxide particles are neutralized of static charges (which hold them to the tape), brushed free, and removed by a vacuum system.



Slide mounted modular electronics are easily accessible from a standing position, as are all controls and test points.



Rear view of the cabinet shows electronics mounting assemblies, their BNC connector panels, and cabinet RFI gasketing.

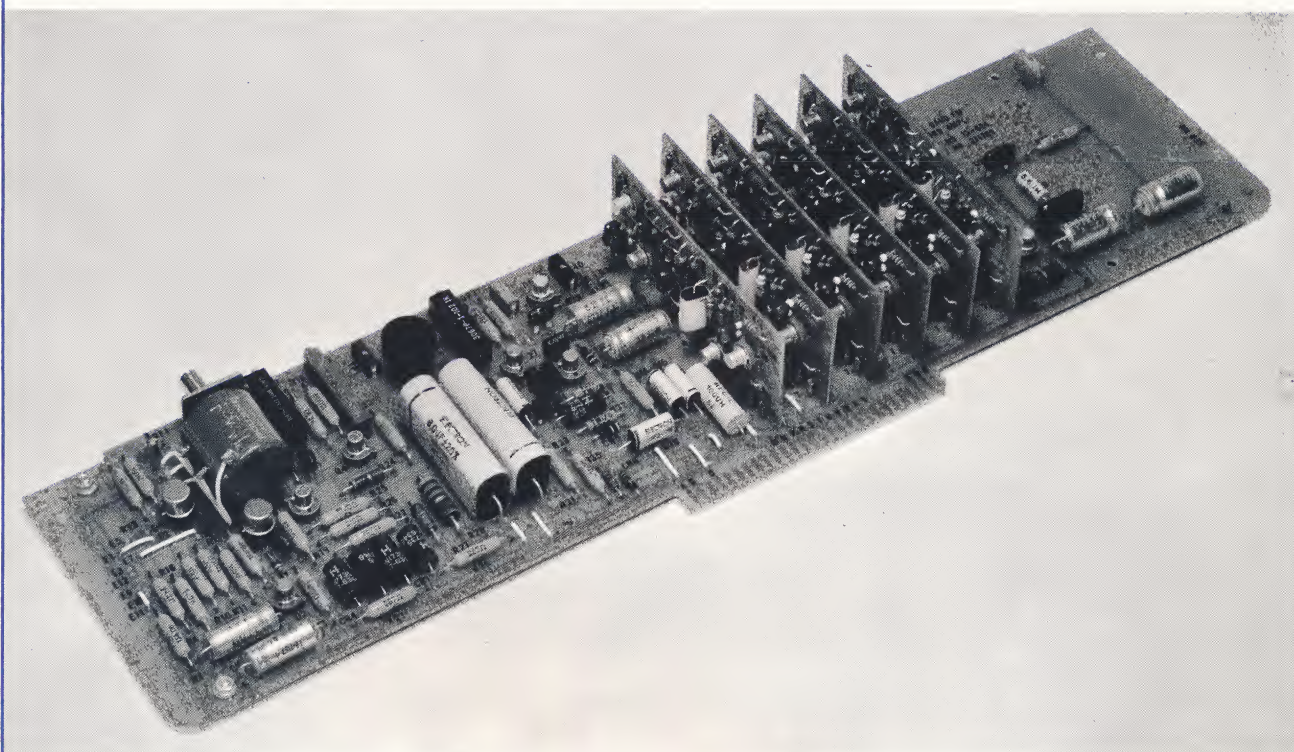
DIRECT SYSTEM

Direct record and reproduce electronics of the VR-3600 Recorder/Reproducer are plug-in, shielded printed circuit cards contained in drawer slide-mounted assemblies. Each drawer has a capacity for seven amplifiers and the system master bias oscillator. Amplifier mounting assemblies, in the closed position, are completely enclosed in a "RFI cage," a metallic structure designed to minimize RFI by radiation. BNC signal connections are accommodated at the rear of the RFI cage, accessible via the system rear door.

Each direct record amplifier contains a signal amplifier, bias buffer amplifier, reference signal/data signal mixer, and bias/signal mixer. All appropriate set-up controls and test points are accessible from the top chassis. Solid-state circuitry is used throughout.

The direct reproduce system includes a reproduce head preamplifier and direct reproduce amplifier with its associated phase and amplitude equalization network plug-ins. The reproduce head preamplifier provides a low impedance output to the head cable and reproduce amplifier from the low level reproduce head signal.

Seven reproduce amplifiers, all similar to the direct record amplifiers, are included in a single amplifier mounting assembly. Plug-in phase and amplitude equalizers for all six system tape speeds are provided in the reproduce amplifiers. The equalizers are automatically connected into the amplifier by tape transport controls for each of the six system tape speeds.



FM Record Amplifier with plug-in center frequency flip-flops for six speeds.

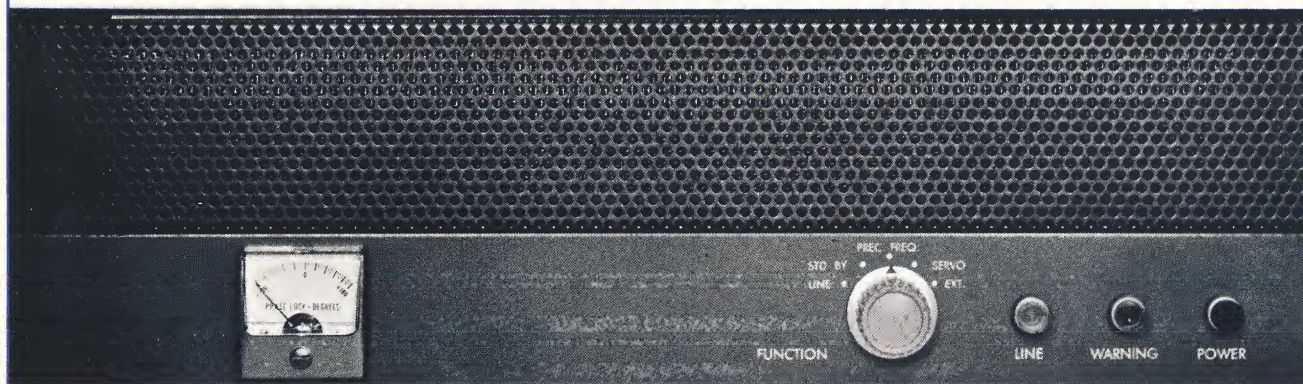
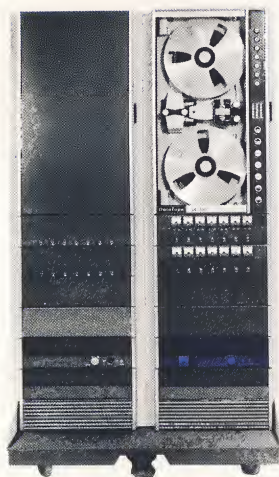
VIDEO FM SYSTEM

The VR-3600 Video FM record and reproduce electronics are plug-in units capable of six-speed operation. Electrically-selectable carrier and data frequency elements are contained in the record electronics for six speeds and in the reproduce electronics for four speeds. The all-solid-state amplifiers are built on printed circuit boards and are covered with a mechanical/electrical shield. Seven record or reproduce amplifiers are contained in a drawer slide-mounted assembly. FM recording is accomplished through the use of a direct record channel for each FM channel.

The FM record amplifier utilizes a single voltage-controlled oscillator (VCO) carrier frequency, regardless of data frequency input or system speed selected. Transport control circuitry selects the center frequency appropriate

to the system speed selected from the FM record amplifier VCO and carrier countdown frequencies, provided by flip-flop dividers.

FM carrier demodulation is accomplished in the FM reproduce amplifier, a plug-in, all-solid-state unit. Magnetic tape playback is achieved through the direct reproduce electronics. There, the signal is phase and amplitude equalized, a mandatory requirement for an FM system with a low modulation index from which low harmonic distortion is required. In each FM reproduce amplifier are elements for automatic operation at any four of the six system speeds. Elements are selected by tape transport control circuitry in accordance with the speed selected.



Capstan Power Amplifier, Precision Frequency Generator, and Tape Speed Control Servo are all contained in a 5½" high drawer.

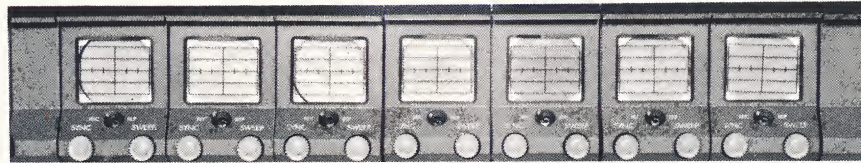
SPEED CONTROL SYSTEM

The tape speed control system of the VR-3600 utilizes a high stability precision frequency generator—in combination with a capstan power amplifier (CPA) to power the transport capstan drive system. Both the precision 60 cps generator and capstan power amplifier are solid-state and are contained in a single slide-mounted assembly.

An optional tape speed control servo can also be installed in the same assembly. It accurately regulates the tape transport capstan motor in such a manner that, during tape playback, the run tape speed is the same as when the

tape was recorded. The control servo corrects for constant or slowly changing tape speed errors, assuring accurate real time reproduction of recorded signals, even though there may be tape speed variations during recording. A precision multifrequency generator which provides a composite reference signal is also available. This composite when recorded on an FM channel enables the tape system to record at any speed under CPA control and play back at any speed under servo control, thereby providing accurate time base expansion or contraction.

ACCESSORIES



MONITOR OSCILLOSCOPES

CEC's monitor oscilloscopes provide visual monitoring of the input and output signals of the magnetic tape system. These units are particularly valuable in analog instrumentation system applications, where a visual display of complex waveforms is desired. The design permits the unit to be used as a general purpose, quick-look, 1.5 mc monitor in laboratories concerned with telemetry, data acquisition,

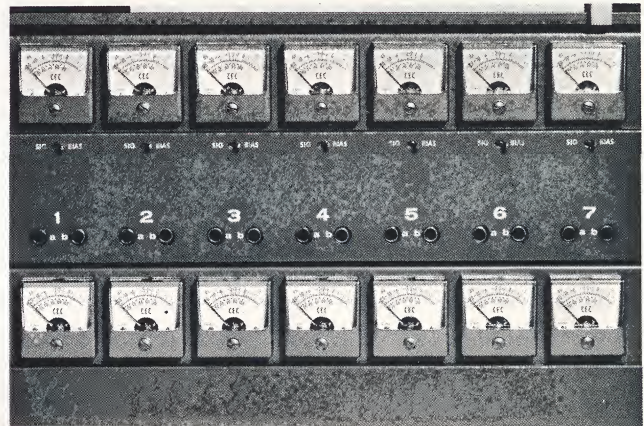
and processing. Seven plug-in scope modules are provided in a 3½ inch high rack mounting unit with a self-contained common power supply.

A front panel switch permits selection of one of two signals for display. Normally, these are the record input and the reproduce output. Solid-state circuitry is provided to drive the 2 inch cathode ray tube.

MONITOR METERS

Input and output signal monitoring systems with panel mounted meters for each amplifier can be supplied as optional equipment on the VR-3600 Recorder/Reproducer. The meters, together with or without front panel attenuators, require no additional rack panel space but form an integral part of the amplifier mounting assembly with which they are associated.

Front panel meters indicate, through switch selection, either record level or bias level for the direct record electronics. Meters are also available that indicate output signal level for direct and FM reproduce amplifiers and signal input level for FM record amplifiers. All meters are calibrated in both db and percent, with scales ranging from -20 to +3 db and from 0 to 100%, 0 db corresponding to 100%.



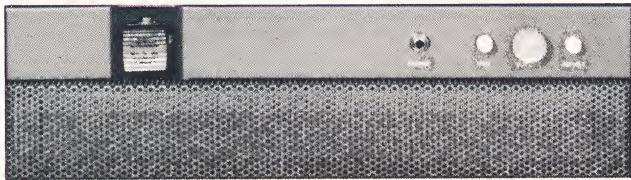
REMOTE CONTROL

A rack mounting remote control unit containing all speed and operating modes, duplicating those found on the transport, is available for use with the VR-3600 Recorder/Reproducer. Back-lighted, color-coded mode controls with mode identification on each pushbutton are used. The remote control unit is connected to the system by an electrical cable terminating at a remote control connector on the tape transport. A unique capability of the CEC remote control unit is its ability to remotely change speeds, select the proper equalization and frequency units in both the direct and FM electronics and interlock the run and record modes until the capstan is at proper speed.



SHUTTLE

The shuttle control assembly allows the repetition of data by automatically cycling the tape back and forth over a preselected length of tape. It can be located remotely or locally for operation in conjunction with other processing equipment. The unit is 5¼" high, 19" wide, 23½" deep, overall and mounts into a standard 19" EIA rack.



OTHER ACCESSORIES

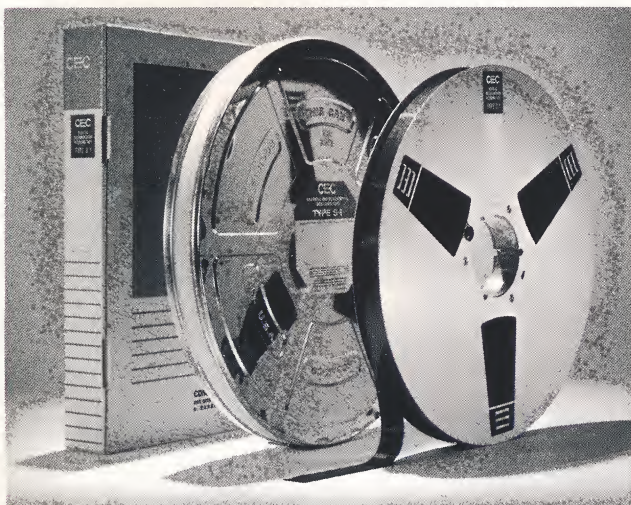
A complete selection of other accessory equipment designed for specific applications are available on request. These accessories are provided for special purpose requirements and usually require minor modification to existing CEC equipment. RFI kit, voice annotation panels for recording and reproducing, input/output patch panels for easy, rapid selection of FM or direct electronics and various additional fail-safe features represent a few of the many accessories or modifications available. Also available, are conventional wideband FM electronics.



Automatic Tape Degausser

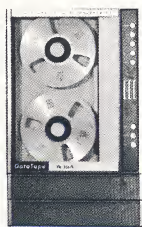


Dynamic Tape Tension Gage

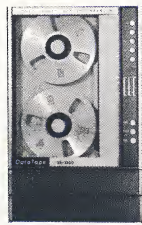


CEC Magnetic Instrumentation Recording Tape Type W-1 is recommended for use with the VR-3600.

OTHER CEC MAGNETIC TAPE RECORDER / REPRODUCERS



PR-3300



VR-3300



GR-2800



VR-2600



VR-2800



GL-2810



DR-2700

Breadth of Consolidated's magnetic tape recorder/reproducer line, which includes analog and digital instrumentation equipment in stationary, mobile, and portable models, makes CEC a single source for virtually all needs in the tape field. Complete information on any of the models shown below can be obtained by writing for the product bulletin.

PR-3300 Combines low cost and portability with excellent performance. Available in 7 or 14 channel record and reproduce configurations, this system is a six-speed machine operating at 60 ips through 1 7/8 ips and covers a frequency range from d-c to 100 kc at 60 ips. Direct, FM or PDM record/reproduce electronics can be used in any combination in this system. Bulletin 3300.

VR-3300 A double bandwidth system for use in applications where portability is desired. Utilizing the same dual capstan tape transport as the PR-3300, this unit provides capability for direct recording of data in the band from 100 cps to 200 kc, and for recording data in an FM mode from 0 to 20 kc at a tape speed of 60 ips. The system features six-speed capability and all solid state electronics. Bulletin 3300V.

GR-2800 An all solid state general purpose recorder/reproducer system, the GR-2800 provides 7 or 14 channel recording and reproducing capability on 1/2 or 1 inch tape. The system is complete in a single six-foot-high cabinet for full fourteen channel record/reproduce operation at tape speeds ranging from 60 ips through 1 7/8 ips. It handles data in the band from 100 cps to 100 kc using direct record/reproduce techniques and 0 to 10 kc using FM record/reproduce techniques at 60 ips. The system features electronics and other components interchangeable with those used in the PR-3300 system. Bulletin 2800.

VR-2600 The only true multispeed wideband system on the market capable of handling data via direct, FM, PDM, or parallel PCM techniques. It handles analog information at six tape speeds which range in two groupings from 120 ips through 1 7/8 ips. System frequency response in the direct mode extends to 600

kc at 120 ips while wideband FM electronics provide a maximum frequency response of 80 kc at 120 ips. PCM systems handle sixteen 1000 bit/inch parallel tracks at all speeds. Seven or fourteen channel analog systems, as well as sixteen track PCM systems are available as standard in the VR-2600 system. Bulletin 2600.

VR-2800 A double bandwidth-general purpose system featuring electronics interchangeable with those in the VR-3300 system is provided in the fourteen-inch-reel VR-2800 system. Data bandwidth handling capacity of the VR-2800 covers the 100 cycle to 200 kc range using direct techniques and 0 to 20 kc using FM techniques at 60 ips. The seven or fourteen channel system uses 1/2 and 1 inch tape and features six-speed operation and plug-in electronics in a single six-foot EMA cabinet. Bulletin 2800V.

GL-2810 A continuous loop magnetic tape record/reproduce system capable of handling seven or fourteen channels of information for repetitive analysis or control applications. This instrument, like the GR-2800 system, provides data handling in the 100 cycle to 100 kc band in the direct mode, and 0 to 10 kc information using FM techniques at 60 ips. The full seven or fourteen channel six-speed system is contained in a single six-foot EMA cabinet and employs electronics interchangeable with those of the PR-3300 and GR-2800 systems. Bulletin 2810.

DR-2700 A high speed vacuum buffered digital magnetic tape read/write system designed for on or off line digital computer application, the DR-2700 is offered as a complete seven or sixteen channel system contained in a standard 72-inch high EMA cabinet. The system is capable of producing and handling IBM compatible tapes at densities up to 555.5 BPI. Outstanding feature of the DR-2700 is its reliability—proven at critical military and commercial installations. Its all solid state design and construction techniques insure ease of maintenance and operation. The DR-2700 features all-metal front surface magnetic heads, as do all CEC recorders, to provide long life in continuous operating applications. Bulletin 2700S.

CONSOLIDATED ELECTRODYNAMICS

DATA RECORDERS DIVISION • 360 SIERRA MADRE VILLA, PASADENA, CALIFORNIA
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Arlington, Virginia
2009 - 14th Street

Chicago, Illinois
2540 W. Peterson Avenue

Columbus, Ohio
1350 West Fifth Avenue

Dallas, Texas
433 Regal Row

Denver, Colorado
2120 S. Birch Street

Hampton, Virginia
1120 W. Mercury Blvd.

Hasbrouck Heights, N.J.
345 Boulevard

Houston, Texas
5405 Griggs Road

Huntsville, Alabama
3322 S. Memorial Parkway

Los Altos, California
900 N. San Antonio Road

Needham Heights, Mass.
45 Fourth Avenue

New Orleans, Louisiana
1025 S. Jefferson Davis
Parkway

Philadelphia, Pennsylvania
2010 Oregon Avenue

Pomona, California
675 North Park Avenue

Salt Lake City, Utah
48 E. Robert Avenue

St. Louis, Missouri
1401 Brentwood Boulevard

Seattle, Washington
302 Second Avenue, West

Syracuse, New York
Pickard Building, Room 162
Malloy Road

Van Nuys, California
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Consolidated Electrodynamics
Division
14 Commercial Rd.
Woking, Surrey, England

GENERAL SPECIFICATIONS

VR-3600 MAGNETIC TAPE RECORDER/REPRODUCER

TAPE TRANSPORT

Tape Speeds:	120, 60, 30, 15, 7½, and 3¾ ips, electrically selectable by backlighted push-buttons.
Tape Speed Accuracy:	±0.2% at 120 ips when driven from 60 cps ±0.01% power source or CEC Capstan Power Amplifier and Precision Frequency Generator, without servo control.
Flutter (Cumulative Peak-to-Peak):	0.25% at 120 ips, from 0.2 cps — 10 kc.
Start Time:	6 seconds max at 120 ips.
Stop Time:	5 seconds or less from any RUN speed.
Rewind Time:	5 minutes for 7200 ft tape.
Dynamic Skew:	±0.4 μseconds between adjacent tracks on the same headstack at 120 ips.
Reel Size:	14 inch maximum, EIA hub, CEC precision reels.
Tape:	½ inch or 1 inch wide, CEC Type W-1.
Search Speed:	Forward and Reverse, individually and continuously adjustable between 60 and 180 ips.

MAGNETIC HEADS

Number of Tracks:	7 per ½ inch of tape width. ½ and 1 inch tape are standard.
Track Pattern:	IRIG standard.
Track Width:	0.050 ±0.002 inch.
Track Spacing:	0.140 inches, center-to-center, track to adjacent track in the same headstack. 0.070 inches, center-to-center, on the tape (interleaved headstacks). Channel position is within ±0.002 inch of nominal.
Headstack Spacing:	1.500 ±0.001 inches, gap line to gap line between interleaved headstacks for record and reproduce pairs.
Azimuth Alignment:	Adjustable on both record and reproduce headstacks. Factory set to better than ±1 minute of arc.
Gap Scatter:	±50 microinches.
Head Life:	1000 hours nominal with recommended tape.

DIRECT SYSTEM

Operating Speeds:	Six, electrically selectable by tape transport control.
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Frequency Response & Signal-to-Noise Ratio:	S/N (RMS Signal to RMS Noise)
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Tape Speed (ips)	Bandwidth (cps)	S/N (RMS Signal to RMS Noise)
120	400 to 1,500,000 ±3 db	20 db
60	400 to 750,000 ±3 db	20 db
30	400 to 375,000 ±3 db	20 db
15	400 to 188,000 ±3 db	20 db
7½	400 to 94,000 ±3 db	20 db
3¾	400 to 47,000 ±3 db	20 db

Pulse Response:	0.5 microsecond maximum rise and fall time at 120 ips.
Harmonic Distortion:	1.0% ±0.3% third harmonic at 1000 cps recorded at 60 ips.
Input Level:	Adjustable between 0.5 and 20 volts peak-to-peak for normal record level.

Input Impedance:	75 ohms ±5% shunted by 250 μfarads maximum, convertible to 10,000 ohms minimum shunted by 250 μfarads maximum.
Output Level:	1.0 volt RMS into 75 ohms, unbalanced to ground for signals received at normal record level.
Output Impedance:	Less than 30 ohms.
Phase Response:	Less than 0.2 μsec total peak-to-peak time delay variation from 100 kc to 1.5 MC at 120 ips.
Bias Frequency:	7.0 megacycles.

VIDEO FM SYSTEM

Operating Speeds:	Six for record system; any four of six for reproduce system, electrically selectable by transport control.
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Frequency Response:	Center Tape Speed (ips)	Frequency (cps)	Bandwidth (cps)
	120	900,000	dc - 500 KC ±3 db
	60	450,000	dc - 250 KC ±3 db
	30	225,000	dc - 100 KC ±3 db
	15	112,500	dc - 50 KC ±3 db
	7½	56,250	dc - 25 KC ±3 db
	3¾	28,125	dc - 12.5 KC ±3 db

Signal-to-Noise Ratio:	28 db RMS signal to RMS noise at 120 ips, over the bandwidth specified above.
D-C Linearity:	±1% of full scale, terminal, zero based.
System Drift:	Total system drift less than 1% of full scale over a 7 hour period after warmup, at constant temperature (±5°F) and line voltage.
Input Level:	Inputs adjustable from 0.5 to 10 volts peak-to-peak for 100% modulation.
Input Impedance:	75 ohms ±5%, shunted by 250 μfarads maximum.
Output Level:	1.0 volt RMS into 75 ohms, unbalanced to ground for signals recorded at 100% modulation.
Output Impedance:	Less than 30 ohms.
Harmonic Distortion:	The total harmonic distortion will be less than 0.5% at 1000 cps.

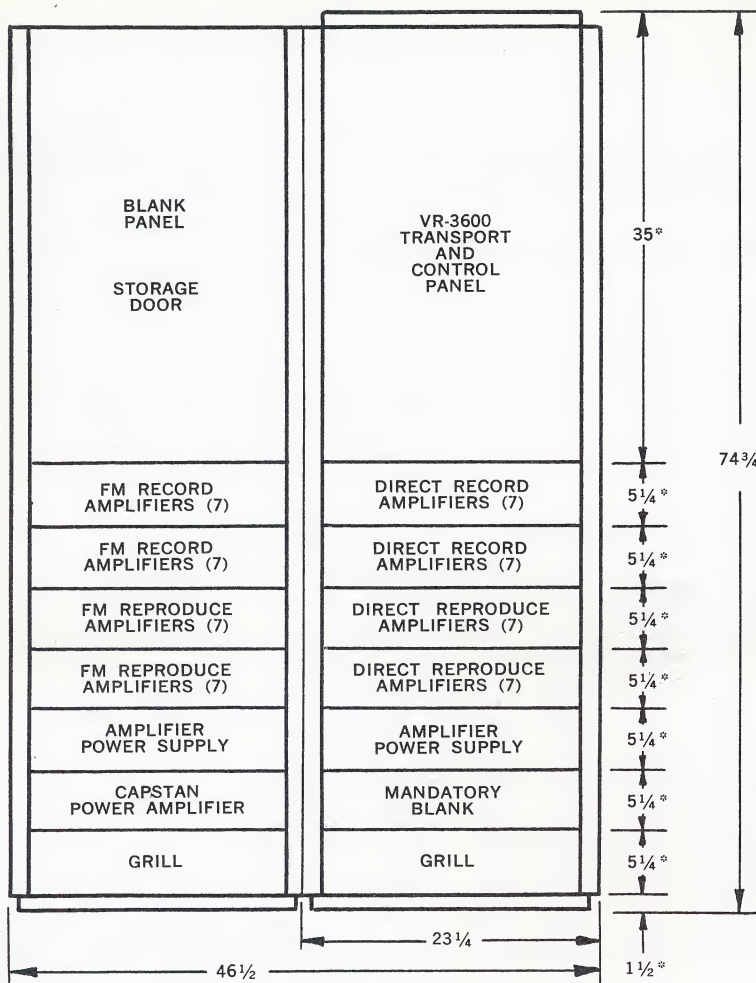
SERVO-SPEED CONTROL SYSTEM

Frequency Standard Accuracy:	±0.01%.
Tape Speed Accuracy:	When reproducing in the servo mode, the reproduced speed will be within ±0.02% of the recorded speed.

Reference Generator Frequencies:	17.0 kc or 18.24 kc.
Input Power:	105 to 125 volts a-c, 58 to 62 cps.
Output Power:	210 volts peak-to-peak minimum square wave under capstan load when synchronized.

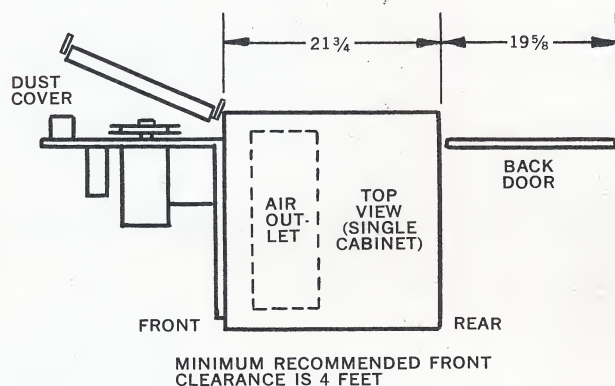
Time Displacement Error:	(variations of less than 0.4 cps)
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Tape Speed	Short Term TDE
120 ips	±0.25 millisecond
60 ips	±0.30 millisecond
30 ips	±0.35 millisecond
15 ips	±0.40 millisecond
7½ ips	±0.55 millisecond
3¾ ips	±0.70 millisecond



TYPICAL 14 CHANNEL DUAL CABINET LAYOUT

*NOMINAL PANEL DIMENSIONS
ALL DIMENSIONS IN INCHES



MONITOR OSCILLOSCOPES

Input Power: 105-125 volts RMS, 58-62 cps, 85 watts maximum.
Input Sensitivity: 0.15 volts RMS/inch to 2.0 volts RMS/inch.
Input Impedance: 500,000 ohms shunted by 120 picofarads maximum.
Frequency Response: D-C to 1.5 mc ± 2 db.
Rise and Fall Time: Less than 0.5 microsecond.
Overshoot: Less than 5%.
Sweep Ranges: 30 cps to 500,000 cps in five ranges with a continuous vernier.
Height: 3 1/2 inches maximum.
Width: 19 inches maximum.
Depth: 24 inches maximum.
Weight: 55 lbs maximum.

POWER REQUIREMENTS

74 3/4" Voltage: 105 to 125 V a-c, 58 to 62 cps, single phase with Capstan Power Amplifier and Precision Frequency Generator.

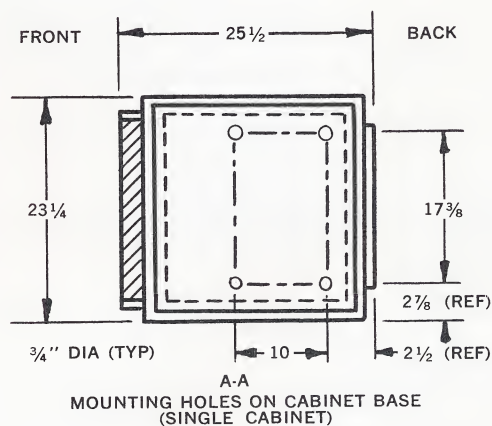
Power: * ~~1/2 inch system 3000 watts, 1 inch system 2400 watts.~~

PHYSICAL AND ENVIRONMENTAL

Height: 74 3/4 inches maximum including all necessary blowers for cooling, but not including rack dolly which adds six inches to overall height.
Width: 23 1/4 inches maximum, overall single cabinet.
46 1/2 inches maximum, overall dual cabinet.
Depth: 25 1/2 inches maximum, overall.
Weight: 950 pounds maximum, including CPA, 7 channels direct record/reproduce and amplifier power supply.
Environment: Operating environment from 40°F to 110°F with relative humidity from 10% to 95%.

NOTE: All specifications subject to change without notice. All specifications based on standard CEC test procedures.

*14 channel direct with Capstan Power Amplifier, 2300 watts.



VR-3600 OUTLINE DIMENSIONS

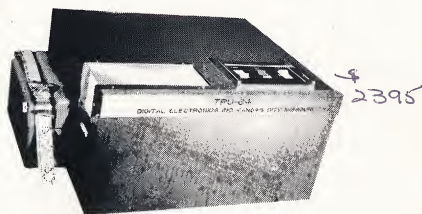
DATA RECORDERS DIVISION

CEC

CONSOLIDATED ELECTRODYNAMICS

360 SIERRA MADRE VILLA, PASADENA, CALIFORNIA - A SUBSIDIARY
OF BELL & HOWELL • FINER PRODUCTS THROUGH IMAGINATION

DIGITAL ELECTRONIC MACHINES, INC.



TPU-64

TAB CARD TO TAPE CONVERTER

SPECIFICATIONS

SIZE — L 15" x W 20" x H 9"

- WEIGHT — 35 lb.

- Punching Speed — 800 characters per minute (48,000/hr.)

- Power Requirements — 100-130 VAC
60 cycle (50 cycle available) 200 watts.

OPTIONAL FEATURES

Internal or External Keyboard — Provides for the Manual Punching of Data in the Tape.

- Tape Codes other than 8 level.

- Alpha-Numeric Printer — Prints all Data from the Input Tab Card.

- Provision to control Data Processing Equipment, Typewriters, Printers, etc.

- TPU-64 is also available without the punch for direct entry into other systems as a hopper fed tab card reader.

- Card or column counters.

- Punch parity check.

Call or write for
additional information . . .

Digital Electronic Machines, Inc.

2130 JEFFERSON
KANSAS CITY, MISSOURI 64108
AREA CODE 816 — 421-3181

ECONOMICAL

Economical — Initial low cost plus operating efficiency makes the TPU-64 ideal for multiple installations throughout your plant — engineering offices — test facilities and research and development facilities. The TPU-64 need not be operated around the clock to pay for itself.

- The TPU-64 has been designed as a tab card punched tape converter. This unit provides a simplified, economical method of preparing punched tape for use by computers, business machines, automatic test equipment, automatic control equipment, numerically controlled machine tools, and other data handling equipment.

VERSATILE

Maximum versatility is obtained with the triple capability of reading Standard tab cards, Hybrid tab cards and Hand punched tab cards. The TPU-64 will read a mixed deck of any or all of the three types of cards, with a read punch speed of 800 characters per minute (48,000/hr.) (Key Punched Cards.) The TPU-64 has an automatic hopper feed and punches 8 level code in the tape. Other tape codes are available.

RELIABLE

Solid State Circuits, and high quality components are used throughout to provide maximum reliability.

- No mechanical adjustments are required. All solid state circuits are on plug-in circuit boards.